

U.S. Patent Application No. 09/694,855
Amendment After Final dated September 4, 2003
Reply to Final Office Action dated June 4, 2003

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

LISTING OF CLAIMS:

Claim 1 (currently amended): A gyricon display comprising:

a) an arrangement of capsules, wherein each capsule comprises a bichromal ball having two hemispheres, wherein one of the hemispheres has at least a surface comprising a ~~modified~~ colored pigment having attached at least one organic group and the other hemisphere has at least a surface with a different color and different electrical properties, wherein each ball is enclosed within a shell wherein a liquid is present between the shell and ball so that the ball is free to rotate in response to an electrical field;

b) first and second electrodes wherein said arrangement is located between said electrodes and wherein at least one of the electrodes is substantially visually transparent; and

c) means for creating a potential difference between the two electrodes, wherein said potential difference causes said bichromal balls to rotate toward one of the electrodes.

Claim 2 (currently amended): A visual display device or display media comprising an arrangement of particles, wherein an optical response results from the rotation of said particles in a fluid, wherein a portion of said particles have attached at least one organic group having an ionic group, ionizable group, or both, and wherein said arrangement of particles is located in said visual display device or said display media, and wherein said

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organic group comprises at least one aromatic or alkyl group that is directly attached to at least a portion of said particles.

Claim 3 (original): The gyron display of claim 1, wherein said bichromal ball is said modified colored pigment.

Claim 4 (original): The gyron display of claim 1, wherein said bichromal ball comprises a pigment with at least one of said hemispheres comprising a surface containing said modified colored pigment.

Claim 5 (currently amended): A capsule comprising a bichromal ball having two hemispheres, wherein one of the hemispheres has at least a surface comprising a ~~modified~~ colored pigment having attached at least one organic group and the other hemisphere has at least a surface with a different color and different electrical properties, wherein said ball is enclosed within a shell wherein a liquid is present between the shell and ball so that the ball is free to rotate.

Claim 6 (currently amended): A capsule comprising a polychromal ball having two or more segments, wherein one of the segments comprises a ~~modified~~ colored pigment having attached at least one organic group and the other segment has a different color and different electrical properties, wherein said ball is enclosed within a shell wherein a liquid is present between the shell and ball so that the ball is free to rotate.

Claim 7 (currently amended): A gyron display comprising:

a) an arrangement of capsules, wherein each capsule comprises a bichromal element having two segments, wherein one of the segments comprises a ~~modified~~ colored pigment having attached at least one organic group and the other segment has at least a surface with a different color and different electrical properties,

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wherein each element is enclosed within a shell wherein a liquid is present between the shell and element so that the element is free to rotate in response to an electrical field;

b) first and second electrodes wherein said arrangement is located between said electrodes and wherein at least one of the electrodes is substantially visually transparent; and

c) means for creating a potential difference between the two electrodes, wherein said potential difference causes said bichromal elements to rotate toward one of the electrodes.

Claim 8 (original): The gyaticon display of claim 7, wherein said bichromal element is a cylinder, a rod, a needle, a ball, or combinations thereof.

Claim 9 (currently amended): A gyaticon display comprising:

(a) an arrangement of capsules, wherein each capsule comprises a polychromal element having at least two segments, wherein one of the segments comprises a ~~modified~~ colored pigment having attached at least one organic group and the other segment has a different color and different electrical properties, wherein each element is enclosed within a shell wherein a liquid is present between the shell and element so that the element is free to rotate in response to an electrical field;

(b) first and second electrodes wherein said arrangement is located between said electrodes and wherein at least one of the electrodes is substantially visually transparent; and

(c) means for creating a potential difference between the two electrodes, wherein said potential difference causes said polychromal elements to rotate toward one of the electrodes.

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Claim 10 (currently amended): A visual display device or display media comprising a) an arrangement of capsules, wherein an optical response results from the rotation of elements in a fluid within said capsule, wherein a portion of the elements comprises a ~~modified~~ colored pigment having attached at least one organic group having an ionic group, ionizable group, or both; and b) means to cause the controlled rotation of the elements to achieve said optical response, and wherein said arrangement of capsules is located in said visual display device or said display media, and wherein said organic group comprises at least one aromatic or alkyl group that is directly attached to at least a portion of said colored pigment.

Claim 11 (currently amended): A capsule comprising a bichromal element having two segments, wherein one of the segments comprises a ~~modified~~ colored pigment having attached at least one organic group and the other segment has at least a surface with a different color and different electrical properties, wherein each element is enclosed within a shell wherein a liquid is present between the shell and the element so that the element is free to rotate.

Claim 12 (currently amended): A capsule comprising a polychromal element having at least two segments, wherein one of the segments comprises a ~~modified~~ colored pigment having attached at least one organic group and the other segment has a different color and different electrical properties, wherein each element is enclosed within a shell wherein a liquid is present between the shell and the element so that the element is free to rotate.

Claim 13 (original): The gyricon display of claim 9, wherein said polychromal element is a cylinder, a rod, a needle, a ball, or combinations thereof.

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Claim 14 (previously presented): The gyaticon display of claim 1, wherein said organic group comprises at least one aromatic group, at least one C₁-C₁₀₀ alkyl group, or mixtures thereof.

Claim 15 (previously presented): The gyaticon display of claim 1, wherein said colored pigment is carbon black.

Claim 16 (previously presented): The gyaticon display of claim 1, wherein said at least one group comprises -X-Sp-[NIon]_pR, -X-Sp-[(-CH₂)_m-O-]_pR, or -X-Sp-[polymer]R, wherein X represents an aromatic group or an alkyl group, NIon represents at least one non-ionic group, Sp represents a spacer group, R represents hydrogen, an aromatic group, or an alkyl group, p is an integer of from 1 to 500, m is an integer of from 1 to 12, and "polymer" comprises repeating monomer groups or multiple monomer groups.

Claim 17 (previously presented): The gyaticon display of claim 1, wherein said particles having attached at least one group comprises -X-Sp-[A]_pR, wherein X represents an aromatic group or an alkyl group, Sp represents a spacer group, A represents an alkylene oxide group of from about 1 to 12 carbons, p represents an integer of from 1 to 500, and R represents hydrogen, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aromatic group.

Claim 18 (previously presented): The visual display device or display media of claim 2, wherein said particles are colored pigments, and wherein said organic group comprises at least one aromatic group, at least one C₁-C₁₀₀ alkyl group, or mixtures thereof.

Claim 19 (previously presented): The visual display device or display media of claim 2, wherein said particles are carbon black.

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Claim 20 (previously presented): The visual display device or display media of claim 2, wherein said at least one group comprises $-X-Sp-[Nlon]_pR$, $-X-Sp-[-(CH_2)_m-O-]_pR$, or $-X-Sp-[polymer]R$, wherein X represents an aromatic group or an alkyl group, Nlon represents at least one non-ionic group, Sp represents a spacer group, R represents hydrogen, an aromatic group, or an alkyl group, p is an integer of from 1 to 500, m is an integer of from 1 to 12 and "polymer" comprises repeating monomer groups or multiple monomer groups.

Claim 21 (previously presented): The visual display device or display media of claim 2, wherein said particles having attached at least one group comprises $-X-Sp-[A]_pR$, wherein X represents an aromatic group or an alkyl group, Sp represents a spacer group, A represents an alkylene oxide group of from about 1 to 12 carbons, p represents an integer of from 1 to 500, and R represents hydrogen, a substituted or unsubstituted alkyl group, or a substituted or unsubstituted aromatic group.

Claim 22 (previously presented): The gyricon display of claim 7, wherein said organic group comprises at least one aromatic group, at least one C_1-C_{100} alkyl group, or mixtures thereof.

Claim 23 (previously presented): The gyricon display of claim 7, wherein said colored pigment is carbon black.

Claim 24 (previously presented): The gyricon display of claim 7, wherein said at least one organic group comprises $-X-Sp-[Nlon]_pR$, $-X-Sp-[-(CH_2)_m-O-]_pR$, or $-X-Sp-[polymer]R$, wherein X represents an aromatic group or an alkyl group, Nlon represents at least one non-ionic group, Sp represents a spacer group, R represents hydrogen, an aromatic

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group, or an alkyl group, and p is an integer of from 1 to 500, m is an integer of from 1 to 12, and "polymer" comprises repeating monomer groups or multiple monomer groups.

Claim 25 (previously presented): The gyricon display of claim 7, wherein said colored pigment having attached at least one organic group comprises $-X-Sp-[A]_pR$, wherein X represents an aromatic group or an alkyl group, Sp represents a spacer group, A represents an alkylene oxide group of from about 1 to about 12 carbons, p represents an integer of from 1 to 500, and R represents hydrogen, substituted or unsubstituted alkyl group, or a substituted or unsubstituted aromatic group.

Claim 26 (previously presented): The capsule of claim 12, wherein said organic group comprises at least one aromatic group, at least one C_1-C_{100} alkyl group, or mixtures thereof.

Claim 27 (previously presented): The capsule of claim 12, wherein said colored pigment is carbon black.

Claim 28 (previously presented): The capsule of claim 12, wherein said modified colored pigment having attached at least one organic group comprises $-X-Sp-[N^{+}on]_pR$, $-X-Sp-[(CH_2)_m-O-]_pR$, or $-X-Sp-[polymer]R$, wherein X represents an aromatic group or an alkyl group, a $N^{+}on$ represents at least one non-ionic group, Sp represents a spacer group, R represents hydrogen, an aromatic group or an alkyl group, and p represents an integer of from 1 to 500, m is an integer of from 1 to 12, and "polymer" comprises repeating monomer groups or multiple monomer groups.

Claim 29 (previously presented): The capsule of claim 12, wherein said pigment having attached at least one organic group comprises $-X-Sp-[A]_pR$, wherein X represents an aromatic group or an alkyl group, Sp represents a spacer group, A represents an alkylene

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oxide group of from about 1 to about 12 carbons, p represents an integer of from 1 to 500,
and R represents hydrogen, a substituted or unsubstituted alkyl group.